NOAA SCIENTIFIC PUBLICATIONS REPORT
November 8, 2015

HIGHLIGHTED ARTICLES

Rapid recent warming of coral reefs in the Florida Keys
Nature Scientific Reports (5.578)

Slow adaptation in the face of rapid warming leads to collapse of the Gulf of Maine cod fishery
Science (31.48)

Reproductive outcome and survival of common bottlenose dolphin sampled in Barataria Bay, Louisiana, USA following the Deepwater Horizon oil spill
Proceedings of the Royal Society of London, Series B (5.051)

Decline in condition of gorgonian octocorals in the northern Gulf of Mexico: before and after Deepwater Horizon oil spill
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Analysis of diarrhetic shellfish poisoning toxins and pectenotoxin-2 in the bottlenose dolphin (*Tursiops truncatus*) by liquid chromatography–tandem mass spectrometry
Journal of Chromatography A (4.169)

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NMFS Publications

On extrapolating past the range of observed data when making statistical predictions in ecology
PLOS ONE (3.534)

The use of redd characteristics, fry fork length and fry density to distinguish the presence of steelhead and resident rainbow trout (*Oncorhynchus mykiss*): Application to the recolonization of the Elwha River after dam removal
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Genetic structure of Pacific trout at the extreme southern end of their native range
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Differences in pigmentation between life cycle stages in *Scrippsiella lachrymosa* (Dinophyceae)
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Genetic mixed stock analysis of an interceptory Atlantic salmon fishery in the Northwest Atlantic
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Purse-seine vessels as platforms for monitoring the population status of dolphin species in the eastern tropical Pacific Ocean
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Global analysis of the effect of local climate on the hatchling output of leatherback turtles
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Ocean heat content reveals secrets of fish migrations
PLoS ONE (3.534)

Interannual variability in the effects of physical habitat and parentage on chinook salmon egg-to-fry survival
Canadian Journal of Fisheries and Aquatic Sciences (2.276)

Shifting thresholds: Rapid evolution of migratory life histories in steelhead/rainbow trout, *Oncorhynchus mykiss*
Journal of Heredity (2.088)

OAR Publications

Spatial and predatory interactions of visually preying nonindigenous zooplankton and fish in Lake Michigan
Journal of Great Lakes Research (1.748)

Precipitation and growth of barite within hydrothermal vent deposits from the Endeavour Segment, Juan de Fuca Ridge
Geochimica et Cosmochimica Acta (4.331)

GLISA RISA team produces special issue on boundary chains for Climate Risk Management
Climate Risk Management (NA)

NWS Publications

Application of pre-NEXRAD reflectivity data to hourly precipitation analyses
Journal of Hydrologic Engineering (1.624)

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

Cruise report for deepwater sediment sampling cruise *M/V* IRISH: Leg 1, 29 May to 10 June 2014, to assess potential benthic impacts from the Deepwater Horizon (DWH) oil spill
NOAA/NCCOS Technical Memorandum

Ciguatoxin concentrations in invasive lionfish estimated using a fluorescent receptor binding assay
16th ICHA Proceedings

Nutrient Bioextraction
Encyclopedia of Sustainability Science and Technology

HIGHLIGHTED ARTICLES

Rapid recent warming of coral reefs in the Florida Keys
Nature Scientific Reports (5.578)
D. Manzello (OAR/AOML)

- Ocean warming drives coral bleaching in the Florida Keys on a near-annual basis.
- The measured rate of warming predicts the start of annual bleaching between 2020 and 2034, sooner than expected from climate models and satellite-based sea temperatures.

The summer and winter of 2014 were the warmest on record for the Florida Keys. In situ temperature data from two Florida Keys reefs from 1975-2014 showed an increase in the number of days above the temperature threshold for bleaching (31.5°C) increased by over 2,500% from the mid-1990s in comparison to the previous twenty years. The measured rate of warming predicts the start of annual bleaching between 2020 and 2034, sooner than expected from climate models and satellite-based sea temperatures. These data show that thermal stress is increasing and occurring on a near-annual basis on Florida Keys reefs due to ocean warming from climate change.
Expected publication date: Fall/Winter 2015

Slow adaptation in the face of rapid warming leads to collapse of the Gulf of Maine cod fishery
Science (31.48)

A. J. Pershing, **M. A. Alexander**, C. M. Hernandez, L. A. Kerr, A. Le Bris, K. E. Mills, J. A. Nye, N. R. Record, H. A. Scannell, **J. D. Scott (NOAA/ESRL)**, G. D. Sherwood, and A. C. Thomas

- Failure to recognize warming waters on Atlantic cod recruitment and overfishing has led to possible recovery problems for this fishery.

Several studies have documented fish populations changing in response to long-term warming. Over the last decade, sea surface temperatures in the Gulf of Maine increased faster than 99% of the global ocean. The warming, which was related to a northward shift in the Gulf Stream and to changes in the Atlantic Multidecadal and Pacific Decadal Oscillations, led to reduced recruitment and increased mortality in the region's Atlantic cod (*Gadus morhua*) stock. Failure to recognize the impact of warming on cod contributed to overfishing. Recovery of this fishery depends on sound management, but the size of the stock depends on future temperature conditions. The experience in the Gulf of Maine highlights the need to incorporate environmental factors into resource management.
Accepted for publication: 23 September 2015
Available online:
http://www.sciencemag.org/content/early/2015/10/28/science.aac9819

Reproductive outcome and survival of common bottlenose dolphin sampled in Barataria Bay, Louisiana, USA following the Deepwater Horizon oil spill
Proceedings of the Royal Society of London, Series B (5.051)
S. M. Lane (NMFS/SER), C. R. Smith, J. Mitchell, **B. C. Balmer (NOS/NCCOS)**, **K. P. Barry (NMFS/SEFSC)**, T. McDonald, C. S. Mori, **P. E. Rosel (NMFS/SEFSC)**, **T. K. Rowles (NMFS/OPR)**, **T. R. Speakman (NOS/NCCOS),** F. I. Townsend, M. C. Tumlin, R. S. Wells, **E. S. Zolman (NOS/NCCOS)**, and **L. H. Schwacke (NOS/NCCOS)**

- A collaborative science team, who has monitored bottlenose dolphins in heavily oiled Barataria Bay for four years following the Deepwater Horizon (DWH) oil spill, is reporting low reproductive success in dolphins exposed to the DWH oil.
- Previous studies have linked the unusually high number of dolphin strandings in the Gulf to the DWH oil spill. Additional studies have also reported poor health including lung disease and adrenal dysfunction following the spill.

- This study confirms low survival rates for dolphins in Barataria Bay as well as decreased reproductive success, with only 20% of pregnant dolphins producing viable calves.

Common bottlenose dolphins (*Tursiops truncatus*) inhabit bays, sounds, and estuaries across the Gulf of Mexico. Following the Deepwater Horizon (DWH) oil spill, studies were initiated to assess potential effects on these ecologically important apex predators. A previous study reported disease conditions, including lung disease and impaired stress response, for 32 dolphins that were temporarily captured and given health assessments in Barataria Bay, Louisiana, USA. Ten of the sampled dolphins were determined to be pregnant with expected due dates the following spring or summer. Here, the authors report findings after 47 months of follow-up monitoring of those sampled dolphins. Only 20% (95% CI: 2.50-55.6%) of the pregnant dolphins produced viable calves, as compared to a previously reported pregnancy success rate of 83% in a reference population. Fifty seven percent of pregnant females that did not successfully produce a calf had been previously diagnosed with moderate-severe lung disease. In addition, the estimated annual survival rate of the sampled cohort was low (86.8%, 95% CI: 80.0-92.7%) as compared to survival rates of 95.1% and 96.2% from two other previously studied bottlenose dolphin populations. These findings confirm low reproductive success and high mortality in dolphins from a heavily oiled estuary when compared to other populations. Follow-up studies are needed to better understand the potential recovery of dolphins in Barataria Bay, and by extension, other Gulf coastal regions impacted by the spill.

Accepted for publication: October 2015

Decline in condition of gorgonian octocorals in the northern Gulf of Mexico: before and after Deepwater Horizon oil spill

Coral Reefs (3.324)

P. J. Etnoyer, **L. N. Wickes**, M. Silva, **J. D. Dubick, L. Balthis, E. Salgado,** and I. R. MacDonald **(NOS/NCCOS)**

- This study used more than 25 years of ROV surveys on deep-reefs to show clear evidence of injury to corals at sites below the oil slick associated with the Deepwater Horizon spill.
- The level of injury to coral colonies changed from 5-10% before the spill, to 30-50% after the spill.

- There is opportunity for restoration of these habitats, because half of the sea fan colonies are intact.

Hard-bottom mesophotic reefs along the 40-fathom (73 m) shelf edge in the northern Gulf of Mexico were investigated for potential effects of the Deepwater Horizon (DWH) oil spill from the Macondo well in April 2010. Alabama Alps Reef, Roughtongue Reef, and Yellowtail Reef were near the well, situated 60–88 m below floating oil discharged during the DWH spill for several weeks and subject to dispersant applications. In contrast, Coral Trees Reef and Madison Swanson South Reef were far from the DWH spill site and below the slick for less than a week or not at all, respectively. The reefs were surveyed by ROV in 2010, 2011, and 2014 and compared to similar surveys conducted one and two decades earlier. Large gorgonian octocorals were present at all sites in moderate abundance including *Swiftia exserta*, *Hypnogorgia pendula*, *Thesea* spp., and *Placogorgia* spp. The gorgonians were assessed for health and condition in a before-after-control-impact (BACI) research design using still images captured from ROV video transects. Injury was modeled as a categorical response to proximity and time using logistic regression. Condition of gorgonians at sites near Macondo well declined significantly post-spill. Before the spill, injury was observed for 4–9% of large gorgonians. After the spill, injury was observed in 38–50% of large gorgonians. Odds of injury for sites near Macondo were 10.8 times higher post-spill, but unchanged at far sites. The majority of marked injured colonies in 2011 declined further in condition by 2014. Marked healthy colonies generally remained healthy. Background stresses to corals, including fishing activity, fishing debris, and coral predation, were noted during surveys, but do not appear to account for the decline in condition at study sites near Macondo well.
Publication date: 20 October 2015
Available online: http://link.springer.com/article/10.1007%2Fs00338-015-1363-2

Sea surface carbon dioxide at the Georgia time series site (2006-2007)
Progress in Oceanography (3.986)
L. Xue, W.-J. Cai, X. Hu**, C. Sabine (OAR/PMEL), S. Jones (OAR/PEML), A.J. Sutton (OAR/PMEL)**, **L.-Q. Jiang (NESDIS/NCEI)**, and J.J. Reimer

- This study is the first full annual record of CO_2 by $MAPCO_2$ in the South Atlantic Bight.

- This study showed that temporal undersampling can greatly bias estimates of air-sea CO_2 flux and net community production.

Carbon dioxide partial pressure (pCO_2) in surface seawater was continuously recorded every three hours from 18 July 2006 through 31 October 2007 using a moored autonomous pCO_2 ($MAPCO_2$) system deployed on the Gray's Reef buoy off the coast of Georgia, USA. Surface water pCO_2 (average 373 ± 52 µatm) showed a clear seasonal pattern, undersaturated with respect to the atmosphere in cold months and generally oversaturated in warm months. High temporal resolution observations revealed important events not captured in previous ship-based observations, such as sporadically occurring biological CO_2 uptake during April-June 2007. In addition to a qualitative analysis of the primary drivers of pCO_2 variability based on property regressions, the authors quantified contributions of temperature, air-sea exchange, mixing, and biological processes to monthly pCO_2 variations using a 1-D mass budget model. Although temperature played a dominant role in the annual cycle of pCO_2, river inputs especially in the wet season, biological respiration in peak summer, and biological production during April-June 2007 also substantially influenced seawater pCO_2. Furthermore, sea surface pCO_2 was higher in September-October 2007 than in September-October 2006, associated with increased river inputs in fall 2007. On an annual basis this site was a moderate atmospheric CO_2 sink, and was autotrophic as revealed by monthly mean net community production (NCP) in the mixed layer. If the sporadic short productive events during April-May 2007 were missed by the sampling schedule, one would conclude erroneously that the site is heterotrophic. While previous ship-based pCO_2 data collected around this buoy site agreed with the buoy CO_2 data on seasonal scales, high resolution buoy observations revealed that the cruise-based surveys undersampled temporal variability in coastal waters, which could greatly bias the estimates of air-sea CO_2 fluxes or annual NCP, and even produce contradictory results.

Accepted for publication: October 2015

ADDITIONAL ARTICLES

NOS Publications

Goods and services of extensive aquaculture: Shellfish culture and nutrient trading
Aquaculture International (0.984)

J.G. Ferreira and **S. B. Bricker (NOS/NCCOS)**

- The role of bivalves in improving water quality has only recently been recognized.
- This review summarizes the role of European shellfish aquaculture production in nutrient management.

Bivalve shellfish play an important role in top-down control of primary symptoms of eutrophication. This short-circuits the process of organic decomposition and promotes an enhancement of underwater light climate, improved oxygenation of bottom water, and restoration of submerged aquatic vegetation. This review analyses this ecosystem service as a potential actor in watershed-level nutrient credit trading programmes and explores the possibilities of implementation of such programs in Europe. The authors examine the different components of the issue, including the eutrophication status of European coastal waters, the legal and management instruments, and the use of mathematical models at both the ecosystem and farm scales to evaluate the potential removal of nitrogen by cultivated shellfish such as oysters, mussels, and clams. The annual European bivalve shellfish production of over 700,000 metric tons is estimated to generate a nitrogen removal of 46,800 t year^{-1} , equivalent to 14, 900,106 population equivalent, and a minimum value of 507, 900, 106 Euros. Future directions for this topic, drawing from ongoing research in the USA and elsewhere, are discussed as for Europe in the light of the twin challenges of European aquaculture expansion and implementation of EU directives.
Publication date: 24 September 2015

Toxicopathological effects of the sunscreen UV filter, oxybenzone (benzophenone-3), on coral planulae and cultured primary cells and its environmental contamination in Hawaii and the U.S. Virgin Islands
Archives of Environmental Contamination and Toxicology (1.895)
C. A. Downs, E. Kramarsky-Winter, R. Segal, J. Fauth, S. Knutson, O. Bronstein, F. R. Ciner, R. Jeger, Y. Lichtenfeld, **C. M. Woodley (NOS/NCCOS)**, P. Pennington, K. Cadenas, A. Kushmaro, and Y. Loya

- Oxybenzone pose an ecological threat to corals and coral reefs, and threatens the resiliency of coral reefs to climate change.
- This study demonstrated that exposure to oxybenzone to “baby” corals caused damage to their DNA, as it is a genotoxicant. Exposure to

oxybenzone to "baby" corals also caused gross morphological deformities and a "skeletal" endocrine disruption; causing the coral planula to inappropriately encase itself in its own skeleton, thereby causing its death. Benzophenone-3 (BP-3; oxybenzone) is an ingredient in sunscreen lotions and personal care products that protects against the damaging effects of ultraviolet light. Oxybenzone is an emerging contaminant of concern in marine environments, produced by swimmers and municipal, residential, and boat/ship wastewater discharges. Researchers examined the effects of oxybenzone on the larval form (planula) of the coral *Stylophora pistillata*, as well as its toxicity in vitro to coral cells from this and six other coral species. Oxybenzone is a photo-toxicant; adverse effects are exacerbated in the light. Whether in darkness or light, oxybenzone transformed planulae from a motile state to a deformed, sessile condition. Planulae exhibited an increasing rate of coral bleaching in response to increasing concentrations of oxybenzone. Oxybenzone is a genotoxicant to corals, exhibiting a positive relationship between DNA-AP lesions and increasing oxybenzone concentrations. Oxybenzone is a skeletal endocrine disruptor; it induced ossification of the planula, encasing the entire planula in its own skeleton. Oxybenzone poses a hazard to coral reef conservation, and threatens the resiliency of coral reefs to climate change.

Publication date: 20 October 2015
Available online: http://link.springer.com/article/10.1007%2Fs00244-015-0227-7

*Analysis of diarrhetic shellfish poisoning toxins and pectenotoxin-2 in the bottlenose dolphin (*Tursiops truncatus*) by liquid chromatography–tandem mass spectrometry*

Journal of Chromatography A (4.169)

Z. Wang, M. H. Broadwater, and **J. S. Ramsdell (NOS/NCCOS)**

- A validated analytical method for unambiguous determination of diarrhetic shellfish poisoning toxins and pectenotoxin-2 in bottlenose dolphins has been established and is described in this paper.
- This method can be extended to a wide range of marine mammals.

Toxins produced by harmful algae are associated with detrimental health effects and mass mortalities of marine mammals. Liquid chromatography–tandem mass spectrometry (LC–MS/MS) is generally used to confirm the presence of algal toxins in marine mammals. Sample preparation and LC–MS/MS methods for the

determination of three diarrhetic shellfish poisoning (DSP) toxins (okadaic acid, OA; dinophysistoxin-1, DTX1; dinophysistoxin-2, DTX2) and pectenotoxin-2 (PTX2) in bottlenose dolphin (*Tursiops truncatus*) urine and tissue samples were evaluated using spike-and-recovery tests. Sample clean-up with either reversed-phase silica or polymeric solid-phase extraction (SPE) reduced interference of sample matrices and improved toxin recoveries, with polymeric SPE showing higher sample loading capacity. LC separation on Xbridge C18 columns using acetonitrile/water gradient elutions with ammonia as the additive was chosen for its high detectivity and sensitivity in the MS detection of DSP toxins in negative ion mode. The retention times of OA, DTX1, and DTX2, separated as negative ions, increased with LC column temperature while the retention time of PTX2, separated as the neutral molecule, was weakly affected. At the same column temperature, retention times of OA, DTX1, and DTX2 gradually increased as the mobile phases aged while the retention time of PTX2 remained unchanged; higher column temperatures resulted in a greater increase in the retention time of each DSP toxin with mobile phase aging. Average recoveries of the 4 toxins in bottlenose dolphin samples ranged from 80% to 130% with relative standard deviations of less than 15% using the LC mobile phases prepared within one week at a column temperature of 30°C or 40°C. The preferred column temperature was 30°C, as the retention times of DSP toxins were less affected by mobile phase aging at this temperature. The limit of detection of each toxin analyzed in bottlenose dolphin samples was 2.8 ng/g or less in tissue samples and 0.7 ng/ml or less in urine.
Expected publication date: October 2015

NMFS Publications

On extrapolating past the range of observed data when making statistical predictions in ecology
PLOS ONE (3.534)
P. B. Conn, **D. S. Johnson**, and **P. L. Boveng (NMFS/AKFSC)**

- This study proposes a criterion for determining whether spatially referenced predictions from statistical models are "outside the range of observed data."
- This may help researchers decide whether and where they should have confidence in predictions (e.g., in maps of animal abundance).

Ecologists are increasingly using statistical models to predict animal abundance and occurrence in unsampled locations. The reliability of such predictions depends

on a number of factors, including sample size, how far prediction locations are from the observed data, and similarity of predictive covariates in locations where data are gathered to locations where predictions are desired. In this paper, the authors propose extending Cook's notion of an independent variable hull (IVH), developed originally for application with linear regression models, to generalized regression models as a way to help assess the potential reliability of predictions in unsampled areas. Predictions occurring inside the generalized independent variable hull (gIVH) can be regarded as interpolations, while predictions occurring outside the gIVH can be regarded as extrapolations worthy of additional investigation or skepticism. The authors conduct a simulation study to demonstrate the usefulness of this metric for limiting the scope of spatial inference when conducting model-based abundance estimation from survey counts. In this case, limiting inference to the gIVH substantially reduces bias, especially when survey designs are spatially imbalanced. The authors also demonstrate the utility of the gIVH in diagnosing problematic extrapolations when estimating the relative abundance of ribbon seals in the Bering Sea as a function of predictive covariates. The authors suggest that ecologists routinely use diagnostics such as the gIVH to help gauge the reliability of predictions from statistical models (such as generalized linear, generalized additive, and spatio-temporal regression models).
Expected publication date: 1 December 2015

*The use of redd characteristics, fry fork length and fry density to distinguish the presence of steelhead and resident rainbow trout (*Oncorhynchus mykiss*): Application to the recolonization of the Elwha River after dam removal*
North American Journal of Fisheries Management (0.954)
J. R. McMillan, **Ge. R. Pess (NMFS/NWFSC)**, **M. Liermann (NMFS/NWFSC)**, **S. A. Morley (NMFS/NWFSC)**, M. McHenry, L. A. Campbell and T. P. Quinn

- This paper examines how to examine how to monitor recolonization of variants in a single species of fish after dam removal.
- Redd attributes and fry density may be useful for evaluating the spatial distribution and relative abundance of steelhead and rainbow trout following dam removal,

The removal of impassable dams can affect stream ecosystems in many ways, including allowing intermixing of life history variants within a single species. The recolonization of anadromous forms into areas previously occupied solely by

residents presents a challenge for monitoring recolonization, because it may be difficult to directly observe staging or spawning adults and the offspring of the forms are often outwardly indistinguishable during early life. Researchers evaluated the utility of redd (nest) attributes, fry (age 0) size and fry density to distinguish the presence of larger anadromous (steelhead) and smaller resident (rainbow trout) forms of *Oncorhynchus mykiss* in the Elwha River, Washington. Redd area and gravel size (D50) successfully discriminated between forms; steelhead redds had significantly larger surface area and had a greater D50 than rainbow trout redds. Fry density was more than twice as high in the steelhead spawning reaches compared to rainbow trout reaches in two years, though significantly so in only one year. In contrast, while fry were slightly longer in steelhead spawning areas compared to areas used by rainbow trout, there was no significant difference. Otolith microchemical analyses revealed that steelhead fry during recolonization were intermediate in size to those found in steelhead and rainbow trout spawning areas prior to dam removal. Thus, fry size may not effectively differentiate parental origin despite the tendency of anadromous parents to be larger and spawn earlier than residents. Redd attributes and fry density may be useful for evaluating the spatial distribution and relative abundance of steelhead and rainbow trout following dam removal, which has implications for other dam removal projects and species.
Accepted for publication: 22 July 2015

Genetic structure of Pacific trout at the extreme southern end of their native range
PLoS One (3.234)
A. Abadía-Cardoso **(UCSC & NMFS/SWFSC)**, J. C. Garza **(NMFS/SWFSC)**, R. L. Mayden and F. J. García de León

- This paper examines poorly studied endemic species of trout in Mexico, which are important due to their extensive use in aquaculture and fisheries.
- Biodiversity among this group is poorly understood, and researchers confirmed substantial genetic diversity in the southernmost native salmonid populations in the world.
- Trout in northwestern Mexico constitute multiple distinct, species-level taxa, only two of which have been formally described previously.

Salmonid fishes are cold water piscivores with a native distribution spanning nearly the entire temperate and subarctic northern hemisphere. Trout in the

genus *Oncorhynchus* are the most widespread salmonid fishes and among the most important fish species in the world, due to their extensive use in aquaculture and valuable fisheries. Trout that inhabit northwestern Mexico are the southernmost native salmonid populations in the world and the least studied in North America. Previous work has described one endemic species, Mexican golden trout (*O. chrysogaster*), and one endemic subspecies, Nelson's trout (*O. mykiss nelsoni*), in Mexico, but previous work indicated that there is vastly more biodiversity in this group than formally described. Researchers conducted a comprehensive genetic analysis using novel genetic markers and techniques to elucidate the biodiversity of trout inhabiting northwestern Mexico, examined genetic population structure of Mexican trout and their relationships to other species of Pacific trout, and measured introgression from non-native hatchery rainbow trout. Researchers confirmed substantial genetic diversity and extremely strong genetic differentiation present in the Mexican trout complex, not only between basins but also between some locations within basins, with at least four species-level taxa present. Researchers revealed significant divergence between Mexican trout and other trout species and the genetic integrity of native trout is still maintained in most locations.

Accepted for publication: 13 October 2015

Progress and challenges of testing the effectiveness of stream restoration in the Pacific Northwest using intensively monitored watersheds

Fisheries (1.25)

G. R. Pess (NMFS/NWFSC), N. Bouwes, **P. Roni (NMFS/NWFSC)**, R. E. Bilby, S. Gallagher, J. Ruzycki, T. W. Buehrens, W. Ehinger, and **C. E. Jordan (NMFS/NWFSC)**

- The authors describe an adaptive management framework for stream restoration aimed to increase freshwater production of salmon and steelhead.
- The most significant challenge reported by intensively monitored watershed (IMW) practitioners is improving coordination between funders, restoration groups, and researchers.

Across the Pacific Northwest at least 17 intensively monitored watershed (IMW) experiments have been implemented to test the effectiveness of a broad range of stream restoration actions for increasing the freshwater production of salmon and

steelhead and to better understand fish-habitat relationships. Researchers describe an adaptive management framework and key elements necessary to implement an IMW, scope and status, challenges, and ways to improve current and future IMWs. Not all IMW experiments incorporate an adaptive management framework or implement the key elements consistently, reflecting the difficulty of such watershed-scale experiments. Improving coordination between funders, restoration groups, and researchers is the most significant challenge reported by IMW practitioners. However, researchers conclude that despite these challenges, the IMW approach is likely the most reliable way we have of assessing the efficacy of restoration, but implementing this approach will require a commitment to long-term funding, treatment of restoration as a management action, and a commitment to adhere to adaptive/experimental management procedures.
Expected publication date: Winter 2015

Differences in pigmentation between life cycle stages in Scrippsiella lachrymosa *(Dinophyceae)*
Journal of Phycology (2.844)
B. C. Smith (NMFS NEFSC), T. Cyronak, E. Cooper, and G. R. DiTullio

- The paper furthers the understanding of what physiological changes occur as a harmful algal bloom dinoflagellate transitions through its life stages.
- Understanding of these changes may provide managers an advantage in bloom detection and monitoring.

Various life cycle stages of cyst-producing dinoflagellates often appear differently colored under the microscope; gametes appear paler while zygotes are darker in comparison to vegetative cells. To compare physiological and photochemical competency, the pigment composition of discrete life cycle stages was determined for the common resting-cyst producing dinoflagellate *Scrippsiella lachrymosa* (J. Lewis). Vegetative cells had the highest cellular pigment content (25.2 ±0.5 pg · $cell^{-1}$); whereas, gamete pigment content was 22% lower. The pigment content of zygotes was 82% lower than vegetative cells even though they appeared darker under the microscope. Zygotes of *S. lachrymosa* contained significantly higher cellular concentrations of ß-carotene (0.65±0.15 pg · $cell^{-1}$) than all other life stages. Photoprotective pigments and the de-epoxidation ratio of xanthophylls-cycle pigments in *S. lachrymosa* were significantly elevated in zygotes and cysts compared to other stages. This suggests a role for accessory pigments in combating

intracellular oxidative stress during sexual reproduction or encystment. Resting cysts contained some pigments even though chloroplasts were not visible, suggesting that the brightly-colored accumulation body contained photosynthetic pigments. The differences in pigmentation between life stages have implications for interpretation of pigment data from field samples when sampled during dinoflagellate blooms.
Publication date: 26 October 2015
Available online: http://onlinelibrary.wiley.com/doi/10.1111/jpy.12364/abstract

Genetic mixed stock analysis of an interceptory Atlantic salmon fishery in the Northwest Atlantic
Fisheries Research (1.843)
I. R. Bradbury, L. C. Hamilton, G. Chaput, M. J. Robertson, H. Goraguer, A. Walsh, V. Morris, D. Reddin, J. B. Dempson, **T. F. Sheehan (NMFS NEFSC)**, and L. Bernatchez

- Provides an assessment of stock composition of Atlantic salmon harvested in the Saint Pierre and Miquelon fishery. USA origin fish were largely absent and hence make little contribution.
- Reports on the inclusion of additional USA origin samples into the North American genetic baseline, the high assignment accuracy of USA origin fish, and the utility of this baseline for assessing the contributions of North American stocks to other Atlantic salmon mixed-stock fisheries.

Interceptory fisheries represent an ongoing threat to migratory fish stocks particularly when managed in the absence of stock specific catch and exploitation information. Atlantic salmon from the southern portion of the North American range may be subject to exploitation in a commercial and recreational harvest occurring in the French territorial waters surrounding Saint Pierre and Miquelon off southern Newfoundland. Researchers evaluated stock composition of Atlantic salmon harvested in the Saint Pierre and Miquelon Atlantic salmon fishery using genetic mixture analysis and individual assignment with a microsatellite baseline (15 loci, 12409 individuals, 12 regional groups) encompassing the species western Atlantic range. Individuals collected from the Saint Pierre and Miquelon fishery over four years (2004, 2011, 2013, and 2014) were analyzed and estimates of stock composition were derived using Bayesian mixture analysis. Biological characteristics of the catch samples indicate significant variation among years in

the size and age distribution. Nonetheless, estimates of stock composition of the samples showed consistent dominance of three regions (i.e., Southern Gulf of St. Lawrence, Gaspe Peninsula, and Newfoundland). Together salmon from these regions consistently account for more than 70% of annual harvest over the decade examined. Comparison of individual assignments and biological characteristics revealed a trend of declining freshwater age with latitude of home region. Moreover, locally harvested Newfoundland salmon were mainly small or one sea winter individuals (~10 times) whereas more Quebec and Gaspe Peninsula salmon were harvested as large or two sea winter salmon (2-3 times), observations consistent with known life history and migration patterns. Estimates of region specific catch were highest for salmon from the southern Gulf of St. Lawrence and Cape Breton region ranging from 242-887 individuals annually. This work illustrates how genetic analysis of interceptory marine fisheries can directly inform assessment and management efforts in highly migratory marine species.
Accepted publication date: 1 October 2015

Environmental influences on the seasonal distribution of Vibrio parahaemolyticus *in Puget Sound*
FEMS Microbiology Ecology (3.568)
R. N. Paranjpye, **W. B. Nilsson**, **M. Liermann**, E.D. Hilborn, B. J. George, Q. Li, **B. D. Bill**, **V. L. Trainer**, **M. S. Strom (NMFS/NWFSC)**, and P. A. Sandifer

- Variability in concentrations of *V. parahaemolyticus* in the water in the Pacific Northwest is correlated with seasonality more than any other abiotic or biotic factor.
- Results underscore the importance of taking into account regional and geographical differences when concentrations of these bacteria in the environment.

Occurrence and distribution of harmful algal blooms (HABs) and pathogenic *Vibrio* bacteria historically have been assessed separately. In this study we assessed the correlation of total (*tl*+) and potentially virulent (*tdh*+) *V. parahaemolyticus* in water with 3 HAB-causing genera, (*Pseudo-nitzschia*, *Alexandrium* and *Dinophysis*), abundance of diatoms and dinoflagellates at five sites in Washington State over two years (2008-2009). Along with temperature and salinity, samples were analyzed for the macronutrients phosphate, nitrate and silicate, ammonium and chlorophyll-a. researchers found that *V. parahaemolyticus*

density was not directly dependent on water temperature, salinity or any of the phytoplankton species. The only significant nutrient associated with *V. parahaemolyticus* density was silicate. The best predictor of *V. parahaemolyticus* density in water was seasonality, in that maximum densities of this bacterium occurred in June of both years prior to the highest seasonal water temperature, although concentrations of both total and *tdh+ V. parahaemolyticus* were higher on average in 2008 than 2009. A high proportion of samples were positive for *tdh* and at levels not reported elsewhere. Differences in salinity, nutrients and the phytoplankton populations in both coastal and estuarine sampling sites did not affect the concentrations of either total or *tdh+ V. parahaemolyticus* suggesting that complex environmental controls affect the occurrence of *Vibrios* in this region. Expected publication date: Fall 2015

Purse-seine vessels as platforms for monitoring the population status of dolphin species in the eastern tropical Pacific Ocean
Fisheries Research (1.903)
C. E. Lennert-Cody, M. N. Maunder, P. C. Fiedler, M. Minami, T. Gerrodette, **J. Rusin (NMFS/SWFSC)**, C. V. Minte-Vera, M. Scott, and S. T. Buckland

- Trend information for dolphin abundance in the eastern tropical Pacific (ETP) is currently not available due to a hiatus in dedicated assessment surveys.
- Despite different assumptions and model structure, tuna vessel observer data currently do not allow for development of a reliable dolphin abundance index.
- The authors discuss several alternative approaches to estimate dolphin abundance.

In the eastern tropical Pacific Ocean, yellowfin tuna (*Thunnus albacares*) are often found in association with spotted (*Stenella attenuata*) and spinner (*S. longirostris*) dolphins. Purse-seine vessels use this co-occurrence to locate the tuna by searching for dolphins and associated birds. Data collected by onboard observers since the late 1970s were used to develop indices of relative abundance for dolphins, based on line-transect methodology, when the primary method of detection of dolphin herds was with binoculars. However, trend estimation was subsequently discontinued in 2000 due to concerns about changes in reporting rates of dolphin herd detections with increased use of helicopter and radar search. At present, as a

result of a hiatus in fishery-independent surveys since 2006, fisheries observer data are the only source of information with which to monitor the status of eastern tropical Pacific Ocean dolphin populations. In this paper, trend estimation with the onboard observer data is revisited using a sightings-per-unit-effort approach. Despite different assumptions and model structure, the results indicate a lack of independence between the distribution of search effort and the search methods used, and the abundance of dolphin herds associated with tunas, on several spatial and temporal scales. This lack of independence poses a considerable challenge to the development of a reliable index of relative abundance for dolphins with these data. Given these results, alternatives for dolphin abundance estimation are discussed. One alternative is the use of purse-seine vessels for line-transect surveys during fishery closure periods. Another alternative is the use of purse-seine vessels during normal fishing operations as platforms for the collection of mark-recapture data (e.g., passive integrated transponder tags or genetics sampling). Life-history data collection, as a supplement to the collection of other data types, is also discussed. Further research and development is needed to assess whether these alternative methods will be useful.
Acceptance date: October 2015

Global analysis of the effect of local climate on the hatchling output of leatherback turtles
Scientific Reports (5.578)
P. S. Tomillo, **V. S. Saba** (**NMFS/NEFSC**), C. D. Lombard, J. M. Valiulis, N. J. Robinson, F. V. Paladino, J. R. Spotila, C. Fernández, M. L. Rivas, J. Tucek, R. Nel, and D. Oro

- Local climate change may impact leatherback sea turtle nesting sites in different ways.
- Globally, leatherbacks may experience local extinctions in some regions but survival on others by the end of the 21st century.

The most recent climate change projections show a global increase in temperatures along with precipitation changes throughout the 21st century. However, regional projections do not always match global projections and species with global distributions may exhibit varying regional susceptibility to climate change. Here we show the effect of local climatic conditions on the hatchling output of leatherback turtles (*Dermochelys coriacea*) at four nesting sites encompassing the

Pacific, Atlantic and Indian Oceans. Researchers found a heterogeneous effect of climate. Hatchling output increased with long-term precipitation in areas with dry climatic conditions (Playa Grande, Pacific Ocean and Sandy Point, Caribbean Sea), but the effect varied in areas where precipitation was high (Pacuare, Caribbean Sea) and was not detected at the temperate site (Maputaland, Indian Ocean). High air temperature reduced hatchling output only at the area experiencing seasonal droughts (Playa Grande). Climatic projections showed a drastic increase in air temperature and a mild decrease in precipitation at all sites by 2100. The most unfavorable conditions were projected for Sandy Point where hatching success has already declined over time along with precipitation levels. The heterogeneous effect of climate may lead to local extinctions of leatherback turtles in some areas but survival in others by 2100.
Accepted: 12 October 2015

Ocean heat content reveals secrets of fish migrations
PLoS ONE (3.534)
J. Luo, J. S. Ault, L. K. Shay, **J. P. Hoolihan**, **E. D. Prince**, **C. A. Brown (NMFS/SEFSC)**, and J. R. Rooker

- Improved technique to calculate estimated locations based on light levels collected through electronic fish tags utilizing Ocean Heat Content (OHC).
- Provides evidence that OHC maps are superior to sea surface temperature maps for revealing pelagic fish habitats.
- Demonstrates that OHC information gathered from pop-up satellite archival tags can be useful as another integrated data source for refining OHC maps and improving the prediction of oceanic state models.

For centuries, the mechanisms surrounding spatially complex animal migrations have intrigued scientists and the public. Here, the authors present a new methodology using ocean heat content (OHC), a habitat metric that is normally a fundamental part of hurricane intensity forecasting, to estimate movements and migration of satellite-tagged marine fishes. Previous satellite-tagging research of fishes using archival depth, temperature and light data for geolocations have been too coarse to resolve detailed ocean habitat utilization. By combining tag data with OHC estimated from ocean circulation and transport models in an optimization framework, the authors substantially improved geolocation accuracy over SST-based tracks. The OHC-based movement track provided the first quantitative

evidence that many of the tagged highly migratory fishes displayed affinities for ocean fronts and eddies. The OHC method provides a new quantitative tool for studying dynamic use of ocean habitats, migration processes and responses to environmental changes by fishes, and further, improves ocean animal tracking and extends satellite-based animal tracking data for other potential physical, ecological, and fisheries applications.
Expected publication date: 20 October 2015
Link to full text paper:
http://www.plosone.org/article/fetchObject.action?uri=info:doi/10.1371/journal.pone.0141101&representation=PDF

Interannual variability in the effects of physical habitat and parentage on Chinook salmon egg-to-fry survival
Canadian Journal of Fisheries and Aquatic Sciences (2.276)
P. Roni, C. L. Johnson, T. DeBoer, and **G. R. Pess (NMFS/NWFSC)**

- Parentage and reach scale environmental factors influence egg-to-fry survival.
- The relative influence of these factors varies annually, presumably depending on the magnitude of high flows and scour during incubation.

Mortality during incubation is believed to be a major factor limiting the recovery of many salmon populations. Direct field measurements of egg-to-fry survival are rare or small in scale. To determine the effects of physical habitat (river reach, fine sediment intrusion, scour), parentage (mating/source of gametes) on Chinook salmon (*Oncorhynchus tshwaytscha*) egg-to-fry survival and developmental stage across a basin, the authors constructed 324 artificial redds in nine reaches over four years in the Yakima River Basin, Washington, USA. Average egg-to-fry survival ranged from 49% to 69% among reaches from 2009 to 2012 brood years. Survival was significantly different among reaches in 2010, but not 2009, 2011 or 2012, while mating, was a significant factor in all years but 2010. In contrast, developmental stage differed significantly among reaches and matings in all four years. Percent of fines, days-in-gravel and median particle size explained only small (<10%) additional amount of variation in survival or developmental stages. These results suggest that parentage and reach within a basin are major factors influencing egg-to-fry survival, but their relative influence vary annually

presumably depending on the magnitude of high flows and scour during incubation.
Acceptance date: 14 September 2015

Shifting thresholds: Rapid evolution of migratory life histories in steelhead/rainbow trout, Oncorhynchus mykiss
Journal of Heredity (2.088)
C. C. Phillis, J. W. Moore, M. Buoro, **S. A. Hayes, J. C. Garza,** and **D. E. Pearse (NMFS/SWFSC)**

- Common garden experiments demonstrate a heritable response to selection in fish above waterfalls and larger size necessary to adopt migrant strategy in above-barrier fish.

Expression of phenotypic plasticity depends on reaction norms adapted to historic selective regimes; anthropogenic changes in these selection regimes necessitate contemporary evolution or declines in productivity and possibly extinction. Adaptation of conditional strategies following a change in the selection regime requires evolution of either the environmentally influenced cue (e.g. size-at-age) or the state (e.g. size threshold) at which an individual switches between alternative tactics. Using a population of steelhead (*Oncorhynchus mykiss*) introduced above a barrier waterfall in 1910, researchers evaluate how the conditional strategy to migrate evolves in response to selection against migration. Researchers created nine families and 917 offspring from 14 parents collected from the above- and below-barrier populations. After one year of common garden-rearing above-barrier offspring were 11% smaller and 32% lighter than below-barrier offspring. Using a novel analytical approach, researchers estimate that the mean size at which above-barrier fish switch between the resident and migrant tactic is 43% larger than below-barrier fish. As a result, above-barrier fish were 26% less likely to express the migratory tactic. The results demonstrate how rapid and opposing changes in size-at-age and threshold size contribute to the contemporary evolution of a conditional strategy and indicate that migratory barriers may elicit rapid evolution towards the resident life-history on timescales relevant for conservation and management of conditionally migratory species.
Acceptance date: 6 October 2015

OAR Publications

Spatial and predatory interactions of visually preying nonindigenous zooplankton and fish in Lake Michigan

Journal of Great Lakes Research (1.748)

H. A. Vanderploeg (OAR/GLERL), S. A. Pothoven (OAR/GLERL), D. Krueger, **D. M. Mason (OAR/GLERL), J. R. Liebig (OAR/GLERL), J. F. Cavaletto (OAR/GLERL), S. A. Ruberg (OAR/GLERL), G. A. Lang (OAR/GLERL),** and R. Ptacnikova

- The authors performed plankton surveys in Lake Michigan and were able to observe the effects of thermal structure on diel vertical migration patterns.
- Extent of daytime diel vertical migration of *Daphnia* is driven by the depth of the boundary between the metalimnion and hypolimnion.
- *Daphnia* migration appears to be a survival strategy of avoiding spatial overlap during daylight hours with visually feeding alewives from below and *Bythotrephes* from above.
- Most spatial overlap of *Daphnia*, *Bythotrephes*, and alewives occurred at night.

A plankton survey system, fisheries acoustics, and opening/closing nets were used to define nearshore-offshore and fine-scale diel vertical spatial interactions among non-indigenous alewives and visually preying cercopagids (*Bythotrephes longimanus* and *Cercopagis pengoi*), and indigenous zooplankton in Lake Michigan on two cruises in August 2004. Because of increased water clarity associated with dreissenid mussel expansion and radically different thermal structure between cruises, authors were able to observe the effects of thermal structure on diel vertical migration under high light conditions favorable to visual predation by cercopagids. Vertical position and overlap between alewives, *Bythotrephes*, and *Daphnia mendotae* at the 60-m site were strongly driven by thermal structure. *Daphnia* showed the strongest diel vertical migration of zooplankton that included migration between the epilimnion at night and the metalimnion-hypolimnion boundary during the day, whereas its major predator, *Bythotrephes*, was confined at all times to the epilimnion-metalimnion. Some alewives migrated from the hypolimnion to the metalimnion and epilimnion at night. As a result, most spatial overlap of *Daphnia*, *Bythotrephes*, and alewives occurred at night. Simple bioenergetics models were used to contrast predatory

interactions between alewives and cercopagids at nearshore and offshore sites. *Bythotrephes* was the preferred prey of alewives, and at the 10-m site, alewives were the major controller of zooplankton because of its elimination of *Bythotrephes*. In contrast, *Bythotrephes* offshore escaped predation because of low spatial overlap with a low concentration of alewives and was the major predator and shaper of the zooplankton community structure.
Expected publication date: 25 October 2015
Available online:
http://www.sciencedirect.com/science/article/pii/S0380133015002038

Precipitation and growth of barite within hydrothermal vent deposits from the Endeavour Segment, Juan de Fuca Ridge
Geochimica et Cosmochimica Acta (4.331)
J. W. Jamieson, M. D. Hannington, M. K. Tivey, T. Hansteen, N. M. Williamson, M. Stewart, J. Fietzke, **D. Butterfield (OAR/PMEL)**, M. Frische, L. Allen, B. Cousens, and J. Langer

- Barite is unique among the major sulfide and sulfide minerals deposited around hydrothermal vents.
- Barite chemistry and morphology can be used as a reliable indicator of past conditions within both extinct seafloor hydrothermal deposits and ancient land-based volcanogenic massive sulfide deposits.

Hydrothermal vent deposits form on the seafloor as a result of cooling and mixing of hot hydrothermal fluids with cold seawater. Amongst the major sulfide and sulfate minerals that are preserved at vent sites, barite ($BaSO_4$) is unique because it requires the direct mixing of Ba-rich hydrothermal fluid with sulfate-rich seawater in order for precipitation to occur. Because of its extremely low solubility, barite crystals preserve geochemical fingerprints associated with conditions of formation. Here, the authors present data from petrographic and geochemical analyses of hydrothermal barite from the Endeavour Segment of the Juan de Fuca Ridge, northeast Pacific Ocean, in order to determine the physical and chemical conditions under which barite precipitates within seafloor hydrothermal vent systems. Petrographic analyses of 22 barite-rich samples show a range of barite crystal morphologies: dendritic and acicular barite forms near the exterior vent walls, whereas larger bladed and tabular crystals occur within the interior of chi

mneys. A two component mixing model based on Sr concentrations and 87Sr/86Sr of both seawater and hydrothermal fluid, combined with 87Sr/86Sr data from whole rock and laser-ablation ICP-MS analyses of barite crystals indicate that barite precipitates from mixtures containing as low as 17% and as high as 88% hydrothermal fluid component, relative to seawater. Geochemical modelling of the relationship between aqueous species concentrations and degree of fluid mixing indicates that Ba2+ availability is the dominant control on mineral saturation. Observations combined with model results support that dendritic barite forms from fluids of less than 40% hydrothermal component and with a saturation index greater than ~0.6, whereas more euhedral crystals form at lower levels of supersaturation associated with greater contributions of hydrothermal fluid. Fluid inclusions within barite indicate formation temperatures of between ~120 and 240°C during barite crystallization. The comparison of fluid inclusion formation temperatures to modelled mixing temperatures indicates that conductive cooling of the vent fluid accounts for 60–120°C reduction in fluid temperature. Strontium zonation within individual barite crystals records fluctuations in the amount of conductive cooling within chimney walls that may result from cyclical oscillations in hydrothermal fluid flux. Barite chemistry and morphology can be used as a reliable indicator for past conditions of mineralization within both extinct seafloor hydrothermal deposits and ancient land-based volcanogenic massive sulfide deposits.
Acceptance date: 31 October 2015

GLISA RISA team produces special issue on boundary chains for Climate Risk Management
Climate Risk Management (NA)
C. J. Kirchoff, M. C. Lemos, and **S. Kalafatis (OAR/CPO)**

- The special issue illustrates how boundary chains not only narrow climate knowledge gaps to support adaptation, but also build capacity and networks that strengthen societal resilience.
- By advancing knowledge on boundary organizations and boundary chains, the papers in this issue highlight the important contributions to theory and practice that NOAA RISAs (including GLISA and the Alaska Center for Climate Assessment and Policy) provide.

An upcoming special issue of the open-access journal Climate Risk Management focuses on the role that boundary organizations, that is, organizations that help broker scientific information between scientists and potential users, play in increasing the use of climate information in the U.S. In particular, research included in the issue seeks to understand how these organizations adapt and innovate. One way in which boundary organizations have innovated is by forming boundary chains to narrow the gap between climate science and adaptation action. Boundary chains form when two or more boundary organizations join forces to leverage each other's resources and strengths to increase the use of climate information. For the past five years, the Great Lakes Integrated Sciences + Assessments (GLISA), NOAA's Great Lakes RISA office, has experimented with the boundary chains concept and approach to facilitate the integration of climate science production and application in decisions to rapidly expand the diversity and extent of its climate outreach.
Expected publication date: Fall 2015

NWS Publications

Application of pre-NEXRAD reflectivity data to hourly precipitation analyses
Journal of Hydrologic Engineering (1.624)
D. A. Miller and **D. Kitzmiller (NWS/NWC)**

- Historical records of precipitation can have important applications in calibrating and providing forcings to hydrologic and land-surface models.
- However, for data collected prior to 1996 (when high spatial and temporal resolution with hourly precipitation estimates were first archived nationally), hourly rainfall estimates must be estimated using temporal downscaling (disaggregation) of daily rain gauge reports.
- The authors found that hourly precipitation estimates since 1996, that make use of NEXRAD Stage-II hourly data, are far more highly correlated with Cooperative (COOP) rain gauge reports than the pre-1996 hourly precipitation estimates.
- Likewise, the authors found that an earlier radar dataset – Manually Digitized Radar (MDR) reports collected from individual WSR-57 and WSR-74 radars from 1978-1994 – provide a similar benefit for the disaggregation process.

Multi-decadal records of hourly precipitation estimates are needed to provide forcings for the simulation of more fine scale temporal processes in hydrologic models. Existing climatological datasets, such as the North American Land Data Assimilation System version-2 (NLDAS2), determine hourly rainfall estimates via temporal downscaling (disaggregation) of daily rain gauge reports. The National Weather Service's (NWS) National Water Center (NWC) compared NLDAS2 hourly precipitation estimates in the period since 1996, when NEXRAD Stage-II hourly data became available for use, with analogous estimates from before 1996, which were disaggregated without the use of hourly radar data. For 20 independently selected days with substantial precipitation during each of the two time periods, authors found that the post-1996 NLDAS2 hourly amounts were far more highly correlated with Cooperative (COOP) rain gauge reports, which were used for verification, than the pre-1996 ones. The authors then explored the possibility that an earlier radar dataset – Manually Digitized Radar (MDR) reports collected from individual WSR-57 and WSR-74 radars during the period 1978-1994 – could provide a similar benefit for the disaggregation process during the pre-NEXRAD era. In comparisons against COOP hourly reports for 37 warm-season days in the Southeast U.S. and 12 cool-season days in California, authors found that the MDR-disaggregated estimates provided significant statistical improvement over the original, NLDAS2 hourly estimates. Finally, the authors prepared CONUS-wide maps for each of the four seasons, providing the ratio of hours with measurable precipitation by the MDR methodology against co-located counts of raining hours from surface observation reports. These maps can be used as masks to determine where MDR data would be effective for use in generating any future, hourly precipitation analyses-of-record (AOR), during the 1994-and-prior period.
Acceptance date : 28 August 2015

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

NOS PUBLICATIONS

Cruise Report for Deepwater Sediment Sampling Cruise M/V IRISH: Leg 1, 29 May to 10 June 2014, to Assess Potential Benthic Impacts from the Deepwater Horizon (DWH) Oil Spill
NOAA/NCCOS Technical Memorandum

C. Cooksey (NOS/NCCOS), J. G. Baguley and P. A. Montagna

- This report documents of findings from the Leg 1 cruise for the Deep Benthic Work Plan Addendum to assess potential effects of the Deepwater Horizon oil spill.
- A total of 2452 physical samples were collected from 56 deep-sea stations for the analysis of various biotic and abiotic environmental variables.
- Conclusions about the potential spatial extent of oil exposure, persistence of oil exposure over time, or resulting biological impacts based on these samples cannot be drawn until ongoing sample analyses are completed.

A cruise was conducted to assess potential effects of the Deepwater Horizon (DWH) oil spill on deep-sea (>200 m) sediments and resident benthic fauna to meet the objectives of the Deep Benthic Work Plan Addendum. This report only documents Leg 1 of the cruise, which was conducted on the *M/V IRISH*, from May 29 to June 10, 2014, under the auspices of the DWH/Natural Resource Damage Assessment (NRDA) Deepwater Benthic Communities Technical Working Group. A total of 2452 physical samples were collected from 56 deep-sea stations for the analysis of various biotic and abiotic environmental variables. At each station, a multi-corer (12 core system) was used to collect sediment samples for analysis of macrofauna, meiofauna, hydrocarbons, metals, and other basic sediment properties (total carbon, total organic carbon, total inorganic carbon, total nitrogen, grain size). A CTD with a dissolved-oxygen (DO) sensor also was deployed to obtain water-column profiles of salinity, temperature, DO, pH, and depth. Stations were included at near-field sites where DWH-related oil was measured at elevated levels during prior response efforts and locations that were in paths of possible oil exposure based on subsurface trajectory-model predictions. Additional response stations were re-sampled that serve as anticipated reference sites. The present cruise report provides a summary of sampling activities. Conclusions about the potential spatial extent of oil exposure, persistence of oil exposure over time, or resulting biological impacts based on these samples cannot be drawn until ongoing sample analyses are completed.
Expected publication date: October 2015

Ciguatoxin concentrations in invasive lionfish estimated using a fluorescent receptor binding assay
16th ICHA Proceedings

R. W. Litaker, **D. R. Hardison**, W. C. Holland, A. J. Bourdelais, J. R. McCall, D. G. Baden, **J. A. Morris, Jr., A. K. Bogdanoff and P. A. Tester (NOS/NCCOS/CCFHR)**

- The fluorescent assay collaboratively developed in this project with UNC-Wilmington can be used as a rapid screening tool for assaying ciguatoxins in fish, the largest cause of non-bacterial seafood poisoning globally.
- Lionfish sometimes contain very low levels of ciguatoxin, but probably not enough to prevent development of a profitable fishery which can be used to manage the destructive effects of this species on reef ecosystems and fisheries.

Invasive lionfish have proliferated throughout the Caribbean, causing extensive environmental damage to reef ecosystems. Given the high densities and extensive range, reef managers are developing local lionfish fisheries as a control strategy. Lionfish have a mild flavor, firm white meat, freeze well, and command high market prices, all factors that favor the establishment of a fishery. The success of this approach in the Caribbean and Gulf of Mexico will depend on the degree to which lionfish accumulate ciguatoxins (CTX) produced by co-occurring dinoflagellates in the genus *Gambierdiscus*. This is of concern because consumption of fish containing elevated CTX concentrations can result in ciguatera fish poisoning (CFP), the largest cause of non-bacterial seafood poisoning worldwide. This study surveyed the concentrations of ciguatoxins in lionfish from throughout the Caribbean and Gulf of Mexico using a novel fluorescent receptor binding assay (RBAf). Approximately 11% of the lionfish contained CTX concentrations slightly above the safety level recommended by FDA, but significantly below levels documented to cause human illness. Implications for developing a lionfish fishery and the need to survey CTX levels in other reef fish commonly consumed without adverse health effects are discussed.
Acceptance date: October 2015

Nutrient Bioextraction
Encyclopedia of Sustainability Science and Technology
J. M. Rose, S. B. Bricker, S. Deonarine, J. G. Ferreira, T. Getchis, J. Grant, J. K. Kim, **J. S. Krumholz**, G. P. Kraemer, K. Stephenson, **G. H. Wikfors**, and C. Yarish **(NMFS NEFSC)**

- Nutrient bioextraction, the cultivation and harvest of shellfish and/or seaweed for the purpose of nutrient removal, is a viable resource management option for the reduction of eutrophication in the coastal environment.

Acceptance date: 8 October 2015